Republic of the Philippines

DAVAO ORIENTAL STATE UNIVERSITY

A university of excellence, innovation, and inclusion

Republic of the Philippines

DAVAO ORIENTAL STATE UNIVERSITY

Guang-guang, Dahican, City of Mati, Davao Oriental

Faculty of Computing, Data Sciences, Engineering and Technology

Information Technology Program

Project X

Automated Attendance System

BSIT 3C

Presented by:

Clande Joey N. Lemosnero

Mhelbourne Jay B. Laurente

Mark Nicholas Balilahon

May 2025

Introduction

1.1 Purpose

The purpose of this study is to design and implement an automated attendance system that addresses the persistent challenges associated with manual attendance tracking in academic institutions. Traditional methods, such as paper-based logs or manual inputs into spreadsheets, are prone to errors, manipulation, and inefficiencies. These issues not only compromise the integrity of attendance records but also consume valuable time that could otherwise be devoted to learning or teaching activities (Yadav & Singh, 2019). With the increasing need for real-time data accuracy, transparency, and automation, it has become essential to adopt more reliable and secure systems. This study aims to develop a modern solution that leverages current technologies to automate the entire attendance process. The system will utilize registered devices for check-ins, capture student photos for identity verification, and store all data in a secure, cloud-based database accessible by authorized users. Additionally, it will incorporate location-based verification to ensure that attendance is recorded only when a user is physically present in a designated area, thereby preventing fraudulent check-ins (Kumar & Goudar, 2014).

Ultimately, the study seeks to provide a comprehensive solution that improves the efficiency, reliability, and security of attendance tracking in academic settings. The expected outcomes include a fully functioning prototype, documented results from system evaluations, and practical recommendations for deployment across educational institutions. This research contributes to the ongoing digital transformation of academic operations and demonstrates the role of thoughtful software architecture and security design in solving real-world problems.

1.2 Objectives of the Study

General Objectives

To design and develop a secure automated attendance monitoring system called Project X for Davao Oriental State University, to improves accuracy, efficiency, and data integrity of the attendance through the integration of QR Code Scanner technologies and other best practices.

This projects also seeks to:

Specific Objectives

1.1 To design and develop a platform for the Attendance Management of Classes of DOrSU that will help in minimizing the manual labor of paper – based transactions.

1.2 To integrate a QR code Scanner technology for a robust security and validity of the Attendance.

1.3 To store and synchronize attendance records in a cloud-based database for real-time access and reporting by authorized users.

1.4 To document findings and provide recommendations for scaling or improving the system for broader deployment across educational institutions.

1.3 Scope and Limitations of the Study

The scope of this study covers the design, development, and evaluation of an automated attendance monitoring system specifically for academic institutions. The system includes key features such as device-based check-ins initiated by registered faculty devices, QR code recognition to authenticate student identities, and location-based validation to ensure physical presence in the classroom. Attendance data is stored and synchronized in a Mysql database for real-time access. Additional features include role-based access control (RBAC), secure communication via HTTPS, audit logging, automated attendance reporting, and input validation to mitigate common security threats. The system is intended for use by faculty members students, academic administrators, and IT staff. However, the study is limited by several factors. It depends on the availability of devices with cameras and stable internet connectivity, which may not be consistently accessible in all classrooms. The Qr code recognition feature may also be affected by lighting conditions, camera quality, and obstructions. Integration with existing institutional systems such as LMS or SIS is not included in the current version. While essential security measures are implemented, advanced protections such as intrusion detection and multi-factor authentication fall outside the project's scope. Additionally, the system is tested only in a controlled academic environment of Davao Oriental State University, and scalability to larger institutions or multi-campus deployments remains to be evaluated. Lastly, the system's effectiveness is partly dependent on user acceptance and consistent use by faculty and students.

1.4 Definition of Terms

1. **Automated Attendance System** – A digital solution designed to record and manage attendance electronically, minimizing manual effort and improving accuracy through technology such as biometrics, location tracking, and real-time data processing.
2. **Device-Based Check-In** – A method of recording attendance that involves initiating the process through a registered faculty device, such as a laptop or tablet, ensuring controlled and authorized attendance sessions.
3. **Role-Based Access Control (RBAC)** – A security mechanism that restricts system access based on the user's role (e.g., admin, faculty, student), ensuring that users can only perform actions relevant to their responsibilities.
4. **HTTPS (Hypertext Transfer Protocol Secure)** – A secure communication protocol used to encrypt data transmitted between the system and its users, protecting it from interception or tampering.
5. **User Acceptance Testing (UAT)** – A phase in the development process where end users test the system in a real-world environment to validate that it meets functional and usability requirements.

REQUIREMENTS

2. REQUIREMENTS

2.1 FUNCTIONAL REQUIREMENTS

2.1.1 User Roles & Access

- The system shall support three user roles:
    1. **Administrator** – manages users, devices, courses, and reports.
    2. **Lecturer** – records student attendance, manages their own registered devices, and takes student photos.
    3. **Student** – is identified by the system and has their attendance recorded.

2.1.2 Device Registration & Authentication

I. A lecturer must register a device (phone, tablet, or computer) before it can be used for attendance tracking.

II. A lecturer may register multiple devices, but each device must be uniquely identifiable.

III. Only registered devices shall be allowed to access the attendance system.

2.1.3 Attendance Tracking

I. The system shall automatically or manually record student attendance when a student enters the classroom.

II. Each attendance record shall include the student's ID, name, timestamp, and course details.

III. Attendance data shall be immediately stored in the cloud database.

IV. The system shall provide an option for manual override in case of errors.

2.1.4 Student Identification & Photo Capture

I. The system shall support photo capture of students using the lecturer's registered device.

II. The photo shall be stored as a file, while the student's ID and name are stored in the database.

III. The system shall enforce passport-style guidelines for student photos.

2.1.5 Location Tracking (Optional Feature)

I. The system may allow lecturers to track the real-time location of their registered device in case it is lost.

II. Location data shall be securely stored and accessible only to authorized users.

2.1.6 Reporting & Data Management

I. The system shall generate attendance reports, listing:

- Students present/absent per session
- Overall attendance trends
- Lecturers and their assigned courses
- Students enrolled in each course

II. Users shall be able to add, edit, delete, and view all items in the system, including students, lecturers, courses, and attendance records.

2.1.7 System Access & API Integration

I. The system shall use a REST API for all database operations.

II. Access control shall be implemented using secure authentication mechanisms.

III. The database shall be cloud-based using MySQL.

2.1.8 Testing Requirements

Testing shall be performed at three levels:

1. User Acceptance Testing (UAT): Ensuring that the system meets business requirements and client expectations.
2. System Testing: Verifying system-wide functionality, including API interactions and database operations.
3. Unit Testing: Testing individual components where applicable to ensure proper functionality.
4. System Development Life Cycle

2.2 NON – FUNCTIONAL REQUIREMENTS

2.2.1 Performance

- The system shall respond to user input within 2 seconds under normal load conditions.
- Attendance check – ins and qr code scanning shall be processed in real – time.

2.2.2 Scalability

- The system shall be designed to support only campuses of DOrSU , each with separate departments, users, and devices.
- The cloud database shall scale automatically to accommodate increasing numbers of students, courses, and attendance records.

2.2.3 Availability

- The system is maintained 75% uptime, ensuring high availability for all users during academic hours.
- Backup systems are placed to minimize downtime in the event of failure such as manual attendance, google form and such.

2.2.4 Security

- User authentication is to be enforced using strong password policies and optional two-factor authentication (2FA).
- All data transmissions between client devices and the server shall use HTTPS encryption.
- Role – based access control (RBAC) shall prevent unauthorized access to restricted features.
- Sensitive information such as student IDs and photos shall be stored securely and comply with privacy standards such as GDPR or local data protection laws.

2.2.5 Usability

- The system shall provide an intuitive and accessible interface for all user roles (Administrator, Lecturer, Student).
- Training documentation and help guides shall be provided to assist first-time users.
- The interface shall be responsive and mobile-friendly.

2.2.6 Maintainability

- The system architecture (MVVM) shall ensure modular design, allowing for easy updates and maintenance.
-
- Error logs and system diagnostics shall be accessible to administrators or IT staff for debugging and monitoring.

2.2.7 Compatibility

- The system should be compatible with major mobile app devices.
- The lecturer device module shall support Windows, macOS, Android, and iOS platforms.

2.2.8 Backup and Recovery

- Attendance data shall be backed up daily on secure cloud storage.
- In the event of data loss or corruption, the system shall support full recovery within 24 hours.

SYSTEM ARCHITECTURE

HIGH LEVEL DESIGN
Entity-Relationship Diagram (ERD) Document

Project Title: Project X
Version: 1.0
Prepared by: Team Gallera
Date: May 16, 2025

1. Introduction

This document outlines the Entity-Relationship Diagram (ERD) for the Attendance Management System. The system supports secure login, role-based access, course scheduling, and QR-based attendance tracking for students and lecturers. This ERD models the data entities and their relationships, which form the foundation of the system's database layer.

2.2. Student

Inherits from User and stores student-specific records.

Field	Type	Key	Description
id_student	int	AI PK	Primary key for student table
fname	varchar(100)		Student's first name
lname	varchar(45)		Student's last name
email	varchar(45)		Student's email address
username	varchar(45)		Student's username
password	varchar(45)		Student's password (hashed)
studentID	varchar(45)		Student's ID number

ctn	varchar(45)		Contact number

2.3. Lecturer

Inherits from User and stores lecturer-specific records.

Field	Type	Key	Description
lecturer_id	Int	Primary Key	Primary key for lecturer table
name	Varchar(100)		Lecturer's name
email	Varchar(100)		Lecturer's email address
phone	varchar(20)		Lecturer's phone number
specialization	Varchar(100)		Lecturer's area of expertise
department	Varchar(100)		Lecturer's department
qualification	varchar(100)		Lecturer's qualifications
created_at	timestamp		When record was created
updated_at	timestamp		When record was last updated
username	varchar(100)		Lecturer's username
password	varchar(45)		Lecturer's password (hashed)

2.4. Class

Represents a course or class handled by a lecturer. This entity inherits from the User model, specifically for storing lecturer-specific class records.

Field	Type	Key	Description
class_id	int	Primary Key	Primary key for class table
class_name	varchar(100)		Name of the class
class_code	varchar(45)		Unique code for the class
description	text		Class description
capacity	Int		Maximum number of students
created_at	timestamp		When class was created
updated_at	timestamp		When class was last updated
room	varchar(45)		Room where class is held

schedule	varchar(45)		Class schedule

2.5. Class_Assign

Where the class assign to the lecturer

Field	Type	Key	Description
classID_ass	int	Primary Key	Primary key for class table
class_id	int	Foreign Key	Foreign key to class table
class_name	varchar(100)		Name of the class
class_code	varchar(45)		Unique code for the class
description	text		Assignment description
instructor_id	int	Foreign Key	Foreign key to lecturer table
created_at	timestamp		When assignment was created
updated_at	timestamp		When assignment was last updated

2.6. QR_Codes

Field	Type	Key	Description
classID_ass	int	Primary Key	Primary key for QR code records
class_id	int	Foreign Key	Foreign key to class table
lecturer_id	int	Foreign Key	Foreign key to lecturer table
qr_data	text		Data encoded in the QR code
generated_at	timestamp		When QR code was generated
expires_at	timestamp	Foreign Key	When QR code expires
is_expired	tinyint(1)		Flag indicating if QR code is expired

2.7. Administrator

Inherits from User and stores admin-specific records.

Field	Type	Key	Description
id_admin	Int	Primary Key	Primary key for admin table
fname	varchar(45)		Admin's first name
lname	varchar(45)		Admin's last name
email	varchar(45)		Admin's email address
username	varchar(45)		Admin's username
password	varchar(45)		Admin's password (hashed)
ctn	varchar(45)		Contact number

2.8. Course

Represents a course offered in the system.

Field	Type	Key	Description
course_id	Int	Primary Key (PK)	Unique course ID
course_code	String		Alphanumeric course code
course_name	String		Course title
description	Text		Optional description of the course
lecturer_id	Int	Foreign Key	References Lecturer.lecturer_id
schedule_id	Int	Foreign Key	References Schedule.schedule_id
student_list	Text/JSON		List of student IDs enrolled

2.9. Attendance

Records attendance via QR code for each course.

Field	Type	Key	Description

attendance_id	Int	AI PK	Primary key for attendance records
student_id	int	Foreign Key	Foreign key to student table
class_id	int	Foreign Key	Foreign key to class table
status	varchar(20)		Attendance status
date_marked	timestamp		When attendance was recorded
marked_by	int	Foreign Key	ID of user who marked attendance

2.10. Logs

Tracks user login activity.

Field	Type	Key	Description
login_id	Int	Primary Key (PK)	Primary key for log records
user_id	varchar(45)		ID of user who performed action
action_time	timestamp		When action occurred
action_type	enum('login','logout','login_failed')		Type of action
status	varchar(45)		Status of the action
details	text		Additional details about the action

3. Relationships Overview

A User has one **Role_Type** (Student, Lecturer, or Administrator).

- A Course is taught by one Lecturer and has one Schedule.

A **Course** is taught by one **Lecturer** and has one **Schedule**.

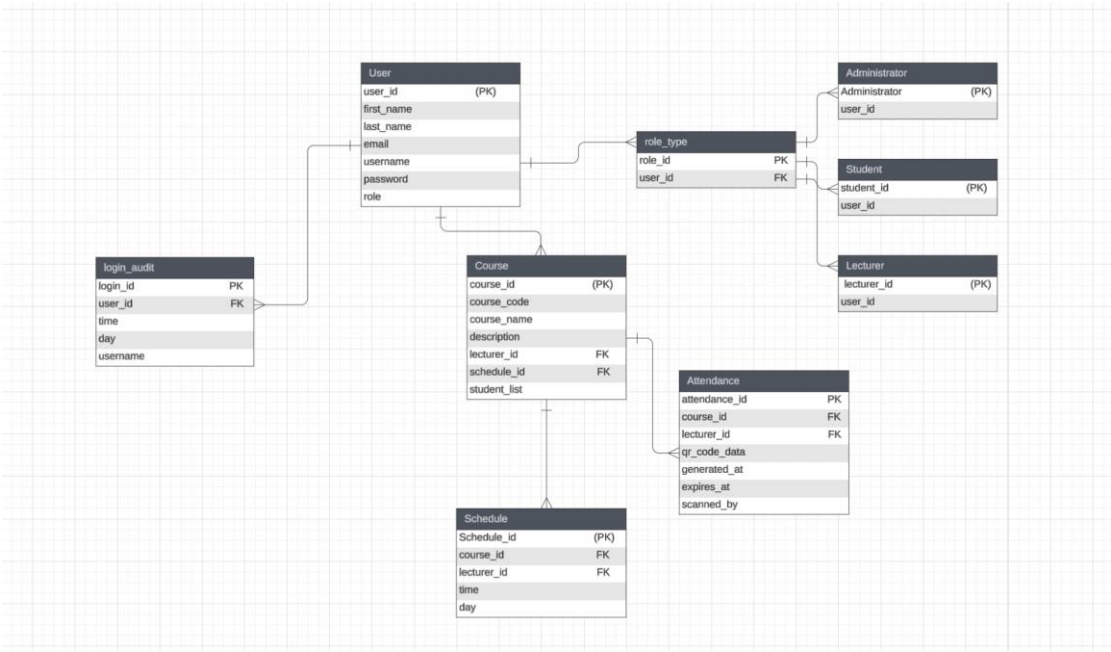
A **Schedule** is linked to a **Course** and a **Lecturer**.

Attendance is tied to both **Course** and **Lecturer**, and stores **QR** metadata.

Login_Audit logs each login event with reference to a User.

4. Conclusion

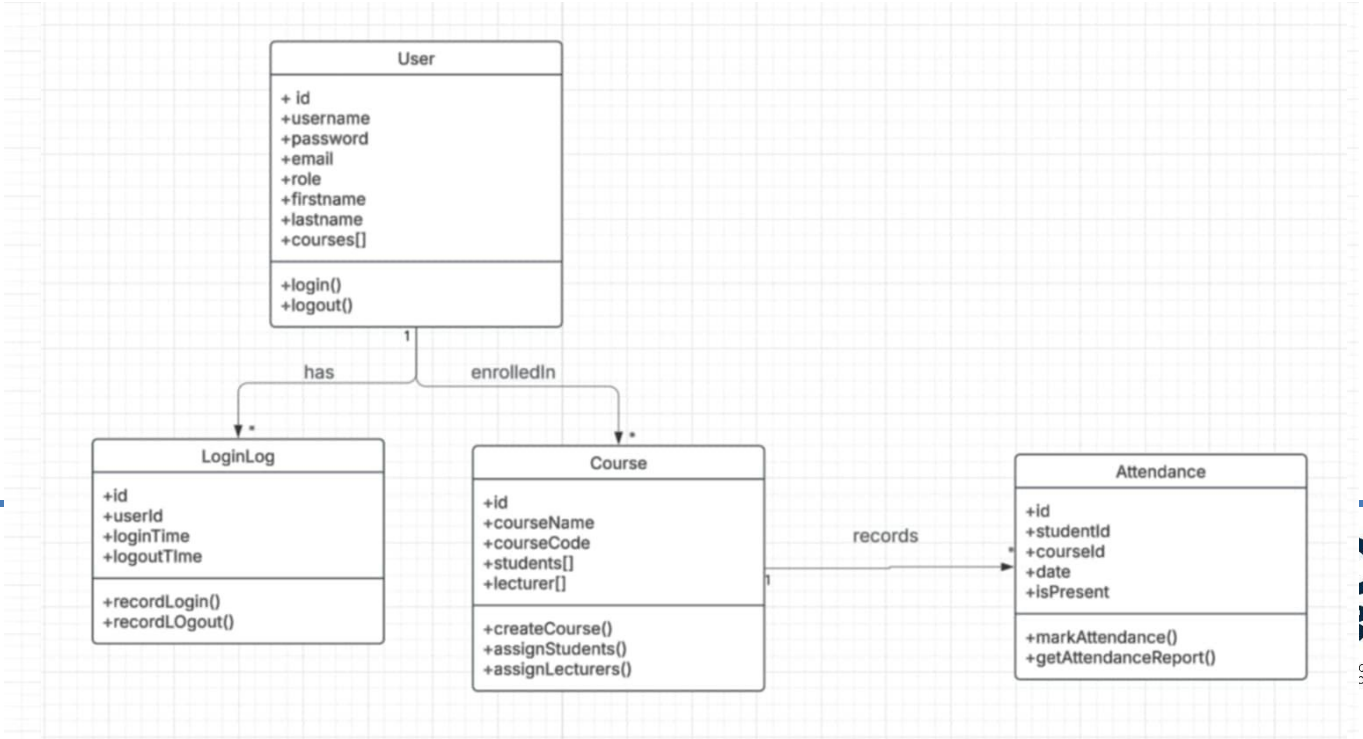
This ERD document outlines a normalized and role-based data structure for the Attendance Management System. It ensures efficient data retrieval, extensibility for new features (e.g., reporting), and compliance with common software architecture principles.



4. Conclusion

This ERD document outlines a normalized and role-based data structure for the Attendance Management System. It ensures efficient data retrieval, extensibility for new features (e.g., reporting), and compliance with common software architecture principles.

DATABASE


User
+ id
+username
+password
+email
+role
+firstname
+lastname
+courses[]
+login()
+logout()
1
has
enrolledIn
*
*
LoginLog
+id
+userId
+loginTime
+logoutTIme
+recordLogin()
+recordLOgout()
Course
+id
+courseName
+courseCode
+students[]
+lecturer[]
+createCourse()
+assignStudents()
+assignLecturers()
records
*
1
Attendance
+id
+studentId
+courseId
+date
+isPresent
+markAttendance()
+getAttendanceReport()

Davao Oriental State University
Guang-guang, Dahican, City of Mati,
Davao Oriental, 8200
Republic of the Philippines

website: www.dorsu.edu.ph
phone: +63 (087) 3883 195
e-mail: op@dorsu.edu.ph
Facebook: @dorsuofficial